

Appl. No. 10/618,061
Restr. Resp. & Amdt. Dated 03/03/2005
Reply to Office Action of February 4, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method of opening an engine valve having a hydraulic actuator to open the engine valve and a return spring for closing the engine valve comprising:
coupling the hydraulic actuator to a source of fluid under pressure to accelerate the engine valve toward the engine valve open position;
continuing to couple the hydraulic actuator to the source of fluid under pressure as the engine valve closing force of the return spring starts to exceed the engine valve opening force of the hydraulic actuator; and,
decoupling the hydraulic actuator from the source of fluid under pressure as the engine valve stops at an engine valve opening wherein the engine valve closing force of the return spring exceeds the engine valve opening force of the hydraulic actuator.
2. (Original) The method of claim 1 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a pilot valve.
3. (Original) The method of claim 2 wherein the pilot valve is a spool valve.
4. (Original) The method of claim 1 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a proportional valve, the proportional valve being hydraulically controlled by electrically controlled valving.
5. (Original) The method of claim 4 wherein the proportional valve is a spool valve.
6. (Original) The method of claim 1 wherein the hydraulic actuator and the return spring are coaxial with the engine valve.

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7. (Original) A method of opening an engine valve having a hydraulic actuator to open the engine valve and a return spring for closing the engine valve comprising:
coupling the hydraulic actuator to a source of fluid under pressure to accelerate the engine valve toward the engine valve open position;
continuing to couple the hydraulic actuator to the source of fluid under pressure as the engine valve closing force of the return spring starts to exceed the engine valve opening force of the hydraulic actuator; and,
blocking flow to and from the hydraulic actuator as the engine valve stops at an engine valve opening wherein the engine valve closing force of the return spring exceeds the engine valve opening force of the hydraulic actuator.
8. (Original) The method of claim 7 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a pilot valve.
9. (Original) The method of claim 8 wherein the pilot valve is a spool valve.
10. (Original) The method of claim 7 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a proportional valve, the proportional valve being hydraulically controlled by electrically controlled valving.
11. (Original) The method of claim 10 wherein the proportional valve is a spool valve.
12. (Original) The method of claim 7 wherein the hydraulic actuator and the return spring are coaxial with the engine valve.
13. (Original) Engine valve apparatus comprising:
an engine valve;
an engine valve return spring disposed to urge the engine valve to a closed position;
a source of fluid under pressure;
a hydraulic actuator disposed to urge the engine valve to an open position;

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valving for controllably coupling the source of fluid under pressure to the hydraulic actuator, for blocking fluid flow to and from the hydraulic actuator and for allowing fluid flow from the hydraulic actuator to a vent; and,

a controller controlling the valving to couple the source of fluid under pressure to the hydraulic actuator until the engine valve stops at an engine valve opening at which the return force urging the engine valve toward the closed position exceeds the hydraulic force urging the engine valve toward the open position, then blocking fluid flow to and from the hydraulic actuator, and to allow fluid flow from the hydraulic actuator to the vent when the engine valve is to be closed.

14. (Original) The apparatus of claim 13 wherein the valving couples the hydraulic actuator to the source of fluid under pressure through an electrically controllable pilot valve.

15. (Original) The apparatus of claim 14 wherein the pilot valve is a spool valve.

16. (Original) The apparatus of claim 13 wherein the valving comprises a hydraulically controlled proportional valve and electrically controllable valving, the hydraulic actuator being coupled to the source of fluid under pressure through the proportional valve, the proportional valve being hydraulically controlled by the electrically controlled valving.

17. (Original) The apparatus of claim 16 wherein the proportional valve is a spool valve.

18. (Original) The apparatus of claim 13 wherein the hydraulic actuator and the return spring are coaxial with the engine valve.

19. (New) The method of claim 1 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a valve hydraulically controlled by electrically controlled valving.

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20. (New) The method of claim 7 wherein the hydraulic actuator is coupled to the source of fluid under pressure through a valve hydraulically controlled by electrically controlled valving.

21. (New) The apparatus of claim 13 wherein the valving comprises a valve hydraulically controlled by electrically controlled valving.